

Darchini (Cinnamon): A versatile drug of medicine

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Abstract- *Cinnamomum verum* (also called cinnamon or darchini) is a well-known spice plant with many medicinal uses. It was earlier called *Cinnamomum zeylanicum*, a name taken from Sri Lanka's old name, Ceylon. This plant mainly grows in Sri Lanka and the southern parts of India. It belongs to the Lauraceae family.

Cinnamon is made from the dried inner bark of the tree after removing the outer layer. Since ancient times, it has been used as a spice and medicine. Today, it is also used in products like candies, chewing gums, mouthwash, and toothpaste.

The plant contains important chemicals such as cinnamaldehyde, cinnamic acid, cinnamate, and eugenol, which give it medicinal properties. These compounds help in many health conditions.

Cinnamon has several health benefits like:

- Antimicrobial (kills germs)
- Helps in wound healing
- Controls diabetes
- Anti-HIV activity
- Reduces anxiety
- Helps in Parkinson's disease

Major chemical components of cinnamon include eugenol, cinnamaldehyde, cinnamyl acetate, camphor, and others. Among these, cinnamaldehyde has been widely studied for its effects.

Overall, *Cinnamomum verum* is an important medicinal plant used worldwide for its health benefits.

Keywords: *Cinnamomum verum*, Darchini, Medicinal properties, Volatile oils, Antimicrobial, Anti-HIV, Antidiabetic

I. INTRODUCTION

The bark of various cinnamon species is one of the most important and popular spices used worldwide not only for cooking but also in traditional and modern medicines. Overall, approximately 250 species have been identified among the cinnamon genus, with trees being scattered all over the world.

Cinnamon bark contains procyanidins and catechins. The components of procyanidins include both procyanidin A-type and B-type linkages. These procyanidins extracted from cinnamon and berries also possess antioxidant activities.

Cinnamon bark from different species is one of the most important and commonly used spices in the world. It is used not only in cooking but also in traditional and modern medicines. There are about 250 types of cinnamon plants found in different parts of the world.

Cinnamon is widely used in the perfume and flavor industries because of its pleasant smell. It is added to foods, perfumes, and medicines. The main chemicals responsible for its smell and health benefits are cinnamaldehyde and trans-cinnamaldehyde, which are present in its essential oil.

Studies show that *Cinnamomum osmophloeum* contains a high amount of cinnamaldehyde in its leaves, so it can be used as a substitute for *Cinnamomum cassia*. Another type, *Cinnamomum zeylanicum*, contains a compound called (E)-cinnamaldehyde, which helps in skin-related benefits by reducing tyrosinase activity.

Cinnamon bark also contains natural compounds like procyanidins and catechins. These compounds act as antioxidants, which help protect the body from damage caused by harmful substances.

In short: Cinnamon is an important spice with a good aroma and many health benefits due to its natural chemical components.

II.METHODOLOGY

The current review was conducted using a complete and organized search of the available literature on the medicinal plant cinnamon from 1982 to 2013. The searches were performed using various databases.

3.Traditional Uses

In addition to being used as a spice and flavoring agent, cinnamon is also added to flavor chewing gums due to its mouth refreshing effects and ability to remove bad breath. Cinnamon can also improve the health of the colon, thereby reducing the risk of colon cancer

Cinnamon is a coagulant and prevents bleeding. Cinnamon also increases the blood circulation in the uterus and advances tissue regeneration. This plant plays a vital role as a spice, but its essential oils and other constituents also have important activities, including antimicrobial, antifungal, antioxidant, and antidiabetic.

Cinnamon has been used as anti-inflammatory, antitermitic, nematocidal, mosquito larvicidal, insecticidal, antimycotic, and anticancer agent. Cinnamon has also been traditionally used as tooth powder and to treat toothaches, dental problems, oral microbiota, and bad breath.

4.Medicinal Uses of Cinnamomum

- Antimicrobial Activity

Cinnamomum zeylanicum (cinnamon) has strong antibacterial properties because it is hydrophobic (repels water). Studies show that its essential oil can kill many harmful bacteria like *E. Coli*, *Salmonella*, and *Staphylococcus*.

Compared to other spices like cumin, cardamom, and clove, cinnamon showed the strongest antibacterial effect. Different extracts (like ethyl acetate and

petroleum ether) also worked well against different bacteria.

- Antioxidant Activity

Cinnamon acts as a powerful antioxidant (protects the body from damage). Among different extracts, the methanol extract of cinnamon showed the highest antioxidant activity. It also increases important antioxidant enzymes like:

- Glutathione
- Catalase
- Superoxide dismutase

These help reduce blood sugar levels, especially in diabetic animals.

- Anti-inflammatory Activity

Cinnamon helps reduce inflammation (swelling and pain).

It works by:

- Blocking enzymes like lipoxygenase (LOX)
- Reducing inflammatory chemicals like IL-6 and TNF- α

This makes it useful in conditions like arthritis.

- Anticancer Activity

Cinnamon extracts can slow down the growth of cancer cells.

A special component (polysaccharide) in cinnamon boosts the immune system and helps fight cancer.

It has shown effectiveness in slowing oral cancer growth.

Antidiabetic Activity

Cinnamon helps control blood sugar levels.

Studies in diabetic animals showed:

- Lower glucose levels
- Improved insulin levels

It also works better when combined with green tea (synergistic effect).

- Wound Healing Activity

Cinnamon extract helps wounds heal faster.

Higher concentration (3%) showed better healing effects in studies.

- Anti-HIV Activity

Cinnamon may help in managing HIV/AIDS, as shown in studies involving medicinal plants.

- Anti-anxiety and Antidepressant Activity

Cinnamon oil helps reduce:

- Anxiety
- Depression

It improves mood and reduces stress-related behavior in experimental tests.

- Anti-Parkinson Activity

Cinnamon may help in Parkinson's disease by protecting brain cells, as seen in animal studies.

- Spasmolytic & Cardiovascular Activity

Cinnamon (especially cinnamaldehyde) helps:

- Relax muscles
- Improve blood flow (vasodilation)

This benefits both the digestive and cardiovascular systems.

5. Chemical Constituents

Cinnamon consists of a variety of resinous compounds, including cinnamaldehyde, cinnamate, cinnamic acid, and numerous essential oils (Table 1). Singh et al. Reported that the spicy taste and fragrance are due to the presence of cinnamaldehyde and occur due to the absorption of oxygen. As cinnamon ages, it darkens in color, improving the resinous compounds. Sangal reported various physicochemical properties of cinnamon (Table 2). The presence of a wide range of essential oils, such as trans-cinnamaldehyde, cinnamyl acetate, eugenol, L-borneol, caryophyllene oxide, β -caryophyllene, L-bornyl acetate, E-nerolidol, α -cubebene, α -terpineol, terpinolene, and α -thujene, has been reported.

Table 1.

Chemical constituents of different parts of cinnamon (Vangalapati et al.).

Part of the plant Compound

Leaves Cinnamaldehyde: 1.00 to 5.00%

Eugenol: 70.00 to 95.00%

Bark Cinnamaldehyde: 65.00 to 80.00%

Eugenol: 5.00 to 10.00%

Root bark Camphor: 60.00%

Fruit trans-Cinnamyl acetate (42.00 to 54.00%)

And caryophyllene (9.00 to 14.00%)

C. zeylanicum buds Terpene hydrocarbons: 78.00%

Alpha-Bergamotene: 27.38%

Alpha-Copaene: 23.05%

Oxygenated terpenoids: 9.00%

C. zeylanicum flowers (E)-Cinnamyl acetate: 41.98%

Trans-alpha-Bergamotene: 7.97%

Caryophyllene oxide: 7.20%

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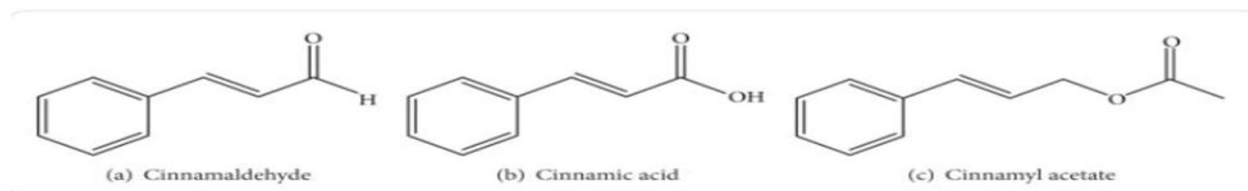
Table 2.

Physicochemical properties of cinnamon (Sangal.,).

Parameter	Leaf oil	Bark oil
Specific gravity (20°C)	1.030–1.050	1.010–1.030
Optical rotation (°) (20°C)	1°96'–0°40'	Slightly laevorotatory
Refractive index (20°C)	1.529–1.537	1.573–1.591
Aldehyde content4%	65–76%	
Eugenol content	77.3–90.5%	4–10%

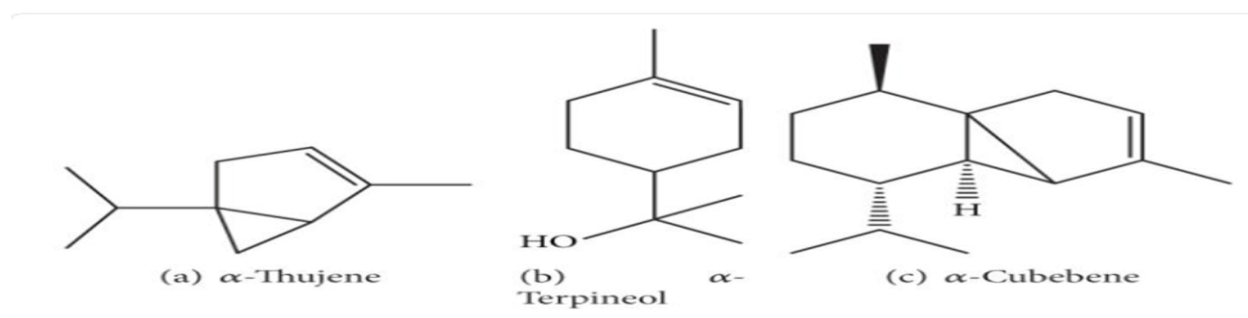
Solubility characteristics Soluble in 1.5 volumes of 70% alcohol Soluble in 2.0–3.0 volumes of 70% alcohol

The chemical structures of some important constituents of cinnamon are shown in Figures 1, 2, 3, 4, and 5.
Figure 1.



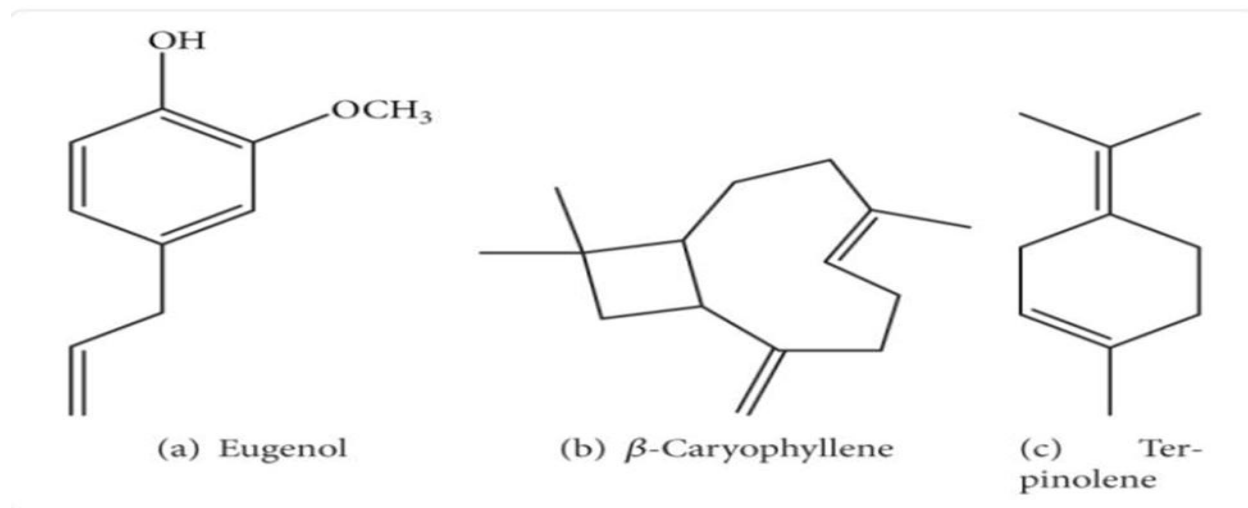
Cinnamyl group-containing compounds.

Figure 2



Endocyclic double bond-containing compounds.

Figure 3.



Unconjugated exocyclic double bond-containing compounds.

6. Antioxidant Activity

Antioxidants in food are very important for our health. They protect our body from damage caused by harmful substances called free radicals. These free radicals are linked to diseases and aging. Antioxidants are also added to oils and food products to prevent spoilage and keep food fresh for a longer time.

Spices and medicinal plants, especially cinnamon, are rich sources of antioxidants.

Studies have shown that different extracts of cinnamon (like water, alcohol, and ether extracts) have strong antioxidant activity. Experiments on rats showed that eating cinnamon bark improved antioxidant levels in the body and protected organs like the heart and liver. Cinnamon oil also acts like natural antioxidant enzymes.

Cinnamon extracts can reduce fat oxidation and prevent damage to cells. Compounds in cinnamon, such as flavonoids and cinnamaldehyde, help neutralize harmful free radicals and reduce inflammation. Some studies found that cinnamon can even reduce nitric oxide production, which is linked to inflammation.

Research has shown that cinnamon has stronger antioxidant activity than many other spices. Its main compounds, like cinnamaldehyde, eugenol, and linalool, are responsible for these effects, with eugenol being especially powerful.

Cinnamon contains many active compounds, and their quantity depends on the age and part of the plant used. For example, bark from certain stages of growth gives more essential oil. Leaves and other parts of cinnamon plants also contain antioxidant compounds.

Different species of cinnamon (like *C. Cassia*, *C. Tamala*, and others) have shown good antioxidant effects in both laboratory and animal studies. Cinnamon can also be used as a natural preservative in foods like cakes.

Cinnamaldehyde is the main compound in cinnamon and has many uses. It can also act as an antityrosinase agent, which helps prevent skin darkening and browning in fruits and vegetables. Because of this,

cinnamon is useful in food, medicine, and cosmetic industries.

7. Anti-Inflammatory Activities

Many studies have shown that cinnamon has anti-inflammatory properties, which means it can help reduce swelling, pain, and inflammation in the body.

Cinnamon contains several natural compounds called flavonoids (like gossypin, hesperidin, quercetin, etc.), and these compounds help reduce inflammation.

One important compound found in cinnamon bark, called 2'-hydroxycinnamaldehyde, works by blocking certain substances in the body (like NF- κ B) that cause inflammation. Because of this, it may be useful as a natural anti-inflammatory medicine.

Extracts of cinnamon (especially alcoholic extracts) can reduce inflammation by blocking certain enzymes and signals in the body that trigger inflammatory responses.

Some compounds from cinnamon also reduce the production of harmful substances like:

- Nitric oxide (NO)
- iNOS (an enzyme related to inflammation)
- COX-2 (another inflammation-causing enzyme)

By reducing these, cinnamon may help protect the brain and could be useful in diseases related to brain inflammation.

Additionally, cinnamon extract can lower the levels of tumor necrosis factor-alpha (TNF- α), a substance that increases inflammation in the body.

- **In short:** Cinnamon helps reduce inflammation by blocking harmful chemicals and enzymes in the body, making it useful for treating inflammatory and possibly brain-related diseases.

8. Neurological Disorders

A compound called cinnamophilin, which is obtained from the plant *Cinnamomum philippinensis*, helps protect the brain. It works by blocking a harmful substance called thromboxane A₂. Studies in rats showed that when cinnamophilin was given (80 mg/kg) after brain injury (at 2, 4, or 6 hours), it

reduced brain damage by about 34–43%. It also improved the animals' behavior and brain function.

Cinnamophilin also protects brain cells from damage caused by lack of oxygen and glucose (energy supply). This was observed in experiments using parts of the brain called the hippocampus.

Another important compound from cinnamon is procyanidin type-A trimers. This compound:

- Reduces swelling of brain cells by controlling calcium levels inside cells
- Improves the uptake of glutamate (an important neurotransmitter)

Protects brain cells by supporting mitochondria (energy-producing parts of cells)

• Cinnamon and Parkinson's Disease

Parkinson's disease is a common brain disorder, especially in people over 65 years. It is caused by damage to brain cells.

A protein called PARK7 (DJ-1) helps protect brain cells from damage and oxidative stress. Cinnamon produces a metabolite called sodium benzoate, which:

- Increases the level of DJ-1 protein
- Enhances brain-protecting factors like BDNF and neurotrophin-3 (NT-3)

These effects help protect nerve cells and may be useful in treating Parkinson's disease.

• Cinnamon and Alzheimer's Disease

Alzheimer's disease is caused by harmful proteins in the brain. A compound from cinnamon extract called CEpt:

- Reduces toxic β -amyloid ($A\beta$) protein formation
- Prevents damage to brain cells
- Improves movement and memory in experimental models
- Reduces plaque formation in the brain

Another study showed that cinnamon extract:

- Reduces tau protein aggregation (a major cause of Alzheimer's)
- Breaks down harmful protein filaments

- Improves the structure of brain cells

9. Antidiabetic Activity

Cinnamon contains a special substance called insulin-potentiating factor (IPF), which helps insulin work better in the body. Studies done on diabetic rats (especially those made diabetic using a chemical called streptozotocin) have shown that cinnamon bark can help reduce blood sugar levels. It has also been found that cinnamon not only lowers blood glucose but also helps reduce cholesterol levels.

In one study, cinnamon extract showed very strong insulin-like activity, about 20 times more effective than other spices. A compound called methylhydroxychalcone polymer (MHCP) is present in cinnamon, which helps the body use glucose more effectively by increasing glucose oxidation. Scientists like Richard Anderson discovered special compounds called polyphenol type-A polymers in cinnamon that act like insulin in the body.

Another compound derived from cinnamon, called naphthalenemethyl ester, also helps in lowering blood sugar levels, further supporting the antidiabetic properties of cinnamon.

Cinnamon is rich in several polyphenols (plant compounds) such as:

- Rutin (major component)
- Catechin
- Quercetin
- Kaempferol

These compounds contribute to its health benefits. A study by Cao showed that purified cinnamon extracts (using a technique called HPLC) have insulin-like effects.

Cinnamon also affects how nutrients are absorbed. It reduces the absorption of alanine in the intestine. Alanine is important because it is converted into glucose in the liver (a process called gluconeogenesis). By reducing alanine absorption, cinnamon may help lower glucose production in the body.

However, not all studies show positive results. For example, in diabetic postmenopausal women, cinnamon supplementation did not improve blood

sugar control significantly. This may be due to differences in:

- Dose of cinnamon used
- Initial blood sugar and lipid levels
- Individual body response

Recent studies using specific types of cinnamon (like the linalool chemotype) at doses of 5, 10, and 20 mg/kg showed improved blood sugar control. This effect may be due to:

- Increased insulin secretion
- Reduced oxidative stress
- Reduced inflammation in the pancreas

These effects may help protect the pancreatic β -cells (cells that produce insulin), although more research is needed to fully confirm this.

10. Antimicrobial Activity

Cinnamon and its oils are known to have strong antimicrobial properties, meaning they can kill or stop the growth of harmful microorganisms like bacteria, fungi, and yeast. Many scientific studies have proven this effect.

For example, a study by Matan et al. Showed that cinnamon oil works against different types of microorganisms. It was effective against bacteria such as *Pediococcus halophilus* and *Staphylococcus aureus*, fungi like *Aspergillus flavus*, *Mucor plumbeus*, and *Penicillium roqueforti*, and also yeast species like *Candida lipolytica* and *Zygosaccharomyces rouxii*. This proves that cinnamon can act as a natural antimicrobial agent.

Another study by Goñi et al. Found that when cinnamon oil is combined with clove oil, it becomes

Even more powerful. This combination can kill both Gram-positive bacteria (such as *Listeria monocytogenes*, *Enterococcus faecalis*, and *Bacillus cereus*) and Gram-negative bacteria (such as *Escherichia coli*, *Salmonella choleraesuis*, and *Pseudomonas aeruginosa*).

Similarly, Hili et al. Reported that cinnamon oil is effective against several bacteria like *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas*

aeruginosa, as well as yeast organisms such as *Candida albicans* and *Saccharomyces cerevisiae*.

Recent research has also shown that cinnamon extracts can help control oral microorganisms (microbes present in the mouth). In fact, cinnamon oil was found to be more effective than extracts from other plants like neem (*Azadirachta indica*) and clove (*Syzygium aromaticum*).

11. Anticancer Activity

Cinnamon contains natural compounds that may help prevent cancer. Studies have shown that the water extract of cinnamon and certain compounds called procyanidins can block an enzyme known as VEGFR2 kinase. This enzyme plays an important role in angiogenesis, which is the formation of new blood vessels that tumors need to grow. By blocking this process, cinnamon may slow down or prevent cancer growth.

Another important compound in cinnamon is cinnamaldehyde. Scientists have modified this compound to create new substances that can stop the formation of blood vessels in tumors. One such compound, called CB403, has been shown to reduce tumor growth in both animal studies and laboratory cell studies. This suggests that cinnamon has strong potential as an anticancer agent.

Cinnamon compounds also affect certain inflammatory pathways linked to cancer. For example, cinnamic aldehyde can block the activity of NF- κ B, a protein that controls inflammation and cancer cell survival. It also reduces the production of IL-8, a substance that promotes tumor growth. This further supports the idea that cinnamon may help fight cancer.

Another compound, trans-cinnamaldehyde, has been found to slow down tumor cell growth and promote apoptosis (programmed cell death), which is important for removing cancer cells.

In animal studies, cinnamon has also shown protective effects against colon cancer. In mice treated with a cancer-causing chemical (AOM), cinnamon increased the activity of protective enzymes like glutathione-S-transferase (GST) and reduced harmful processes like lipid peroxidation. This indicates that cinnamon helps

the body fight cancer by improving its antioxidant defense system.

Additionally, essential oils from cinnamon can reduce melanin production and oxidative stress in melanoma (skin cancer) cells.

12. Cardiovascular Diseases

Cinnamon contains an active compound called 2-methoxycinnamaldehyde (2-MCA), which is obtained from *C. Cassia*. This compound helps reduce inflammation in blood vessels by lowering the levels of a protein called VCAM-1, especially when cells are activated by harmful substances like TNF- α . Because of this, it can help protect the body from damage caused during ischemia/reperfusion (I/R) injury (a condition where blood supply returns to tissue after a lack of oxygen). This protective effect is mainly due to the activation of an enzyme called heme oxygenase-1 (HO-1).

Other compounds from cinnamon, such as cinnamaldehyde and cinnamic acid, have also shown beneficial effects in heart-related conditions like myocardial ischemia (reduced blood flow to the heart). This suggests that cinnamon may be useful in treating cardiovascular diseases.

Another important compound, cinnamophilin, obtained from *C. Philippinensis*, plays a major role in heart protection. It blocks the action of thromboxane A₂ (TXA₂), a substance that causes blood clotting and narrowing of blood vessels. By acting as both a thromboxane synthase inhibitor and a TXA₂ receptor blocker, cinnamophilin helps reduce platelet aggregation (clot formation) and may also be useful in diseases like cancer. It also prevents the abnormal growth of smooth muscle cells in blood vessels, which helps in reducing the risk of atherosclerosis (hardening of arteries).

Cinnamaldehyde also helps in lowering blood pressure (hypotensive effect). It does this mainly by relaxing blood vessels (vasodilation), which improves blood flow. Studies in animals like dogs and guinea pigs have shown that this effect lasts even after blood pressure returns to normal levels.

Additionally, cinnamaldehyde relaxes the smooth muscles of blood vessels without depending on the

inner lining of the vessels (endothelium-independent action). This happens because it blocks the entry and release of calcium ions (Ca²⁺), which are necessary for muscle contraction. By doing this, cinnamaldehyde helps reduce high blood pressure, especially in conditions like type 1 and type 2 diabetes, where blood vessel contraction is increased. It also supports insulin activity, which further helps in controlling blood pressure.

13. Cholesterol- and Lipid-Lowering Effect

Cinnamon has been shown to improve fat (lipid) levels in the body in different studies on animals and humans.

In one study on mice, giving cinnamon helped improve their lipid profile. It reduced the level of harmful fats like triglycerides in the blood. However, it also caused a decrease in HDL cholesterol, which is usually known as “good cholesterol.”

Another study on rats showed that when they were given *Cinnamomum cassia* powder (about 15% in their diet) for 35 days, there was a decrease in total cholesterol, triglycerides, and cholesterol (also called “bad cholesterol”). This means cinnamon helped lower unhealthy fat levels in their body.

In poultry (broiler chickens), cinnamon oil was also found to reduce cholesterol levels, showing that its beneficial effects are seen in different animals.

In humans, a study by Khan and colleagues found that taking cinnamon daily in doses of 1 g, 3 g, or 6 g helped reduce several important health markers. These included blood sugar (glucose), triglycerides, total cholesterol, and LDL cholesterol. This suggests that cinnamon may help improve both blood sugar control and heart health in people.

Conclusions

Cinnamon is a common spice that people use every day in food, and it is generally considered safe when taken in normal amounts. Scientists have studied cinnamon in different forms, such as its bark, essential oil, powder, and natural chemical components like phenols and flavonoids. All of these forms contain useful substances that can help improve human health in various ways. Some of the health benefits of cinnamon come from its direct actions. For example, its antioxidant properties help protect the body by

neutralizing harmful substances called free radicals, which can damage cells. Its antimicrobial properties help fight against bacteria, fungi, and other harmful microorganisms, preventing infections. Other benefits of cinnamon happen indirectly inside the body. These include its anti-inflammatory, anticancer, and antidiabetic effects. Instead of acting directly, cinnamon works by influencing certain receptors and biological pathways in the body. This helps reduce inflammation, control blood sugar levels, and may even slow down the growth of cancer cells. Overall, many types of cinnamon have shown important health benefits. However, more scientific research, especially clinical studies on humans, is still needed to fully confirm how effective cinnamon is in treating serious conditions like cancer, inflammation-related diseases, heart problems, and brain disorders.

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